

1 **WHAT IS CLAIMED IS:**

1 1. An article of manufacture comprising an optical-ready substrate made of a first
2 semiconductor layer, an insulating layer on top of the first semiconductor layer, and a second
3 semiconductor layer on top of the insulating layer, wherein the second semiconductor layer has a
4 top surface and is laterally divided into two regions including a first region and a second region,
5 the top surface of the first region being of a quality that is sufficient to permit microelectronic
6 circuitry to be formed therein and said second region including an optical signal distribution
7 circuit formed therein, said optical signal distribution circuit made up of interconnected
8 semiconductor photonic elements and designed to provide signals to the microelectronic circuit
9 to be fabricated in the first region of the second semiconductor layer.

1 2. The article of manufacture of claim 1 wherein the semiconductor photonic
2 elements of the optical signal distribution circuit include optical waveguides and output elements
3 coupled to the optical waveguides for delivering signals carried by the waveguides to the
4 microelectronic circuitry.

1 3. The article of manufacture of claim 2 wherein said output elements are optical
2 detectors which convert optical signals to electrical signals.

1 4. The article of manufacture of claim 1 wherein the optical signal distribution
2 network is an optical clock signal distribution network.

1 5. The article of manufacture of claim 1 wherein the first semiconductor layer
2 comprises silicon.

1 6. The article of manufacture of claim 4 wherein the insulating layer comprises an
2 oxide of a silicon oxide.

1 7. The article of manufacture of claim 6 wherein the second semiconductor layer
2 comprises silicon.

1 8. The article of manufacture of claim 1 wherein the combination of the first
2 semiconductor layer, the insulating layer and the second semiconductor layer is an SOI structure.

1 9. The article of manufacture of claim 1 wherein the second region of the second
2 semiconductor layer is thicker than the first region of the second semiconductor layer.

1 10. The article of manufacture of claim 1 wherein the top surface of the first region is
2 of a quality that is sufficient to permit CMOS circuitry to be formed therein.

1 11. An article of manufacture comprising:
2 a first semiconductor chip including an optical signal distribution circuit formed in
3 the topside thereof; and
4 a second semiconductor chip including a microelectronic circuit formed in the
5 topside thereof, said first chip mounted on top of said second chip so that the topsides thereof are
6 opposite each other and arranged so that the optical signal distribution circuit delivers signals to
7 and/or receives signals from the microelectronic circuit when operating.

1 12. The article of manufacture of claim 11 wherein the first semiconductor chip
2 comprises a first semiconductor layer, an insulating layer on top of the first semiconductor layer,
3 and a second semiconductor layer on top of the insulating layer, wherein the second
4 semiconductor layer has a top surface with said optical signal distribution circuit formed therein,
5 said optical signal distribution circuit made up of interconnected semiconductor photonic
6 elements.

1 13. The article of manufacture of claim 12 wherein the semiconductor photonic
2 elements of the optical signal distribution circuit include optical waveguides and output elements
3 coupled to the optical waveguides for delivering signals carried by the waveguides to the
4 microelectronic circuitry.

1 14. The article of manufacture of claim 13 wherein said output elements are optical
2 detectors which convert optical signals to electrical signals.

1 15. The article of manufacture of claim 11 wherein the optical signal distribution
2 network is a optical clock signal distribution network.

1 16. A method comprising:
2 by using a first set of semiconductor fabrication processes, fabricating an optical-
3 ready substrate comprising a first semiconductor layer, an insulating layer on top of the first
4 semiconductor layer, and a second semiconductor layer on top of the insulating layer, wherein

5 the second semiconductor layer has a top surface and is laterally divided into two regions
6 including a first region and a second region, the top surface of the first region being of a quality
7 that is sufficient to permit microelectronic circuitry to be formed therein and said second region
8 including an optical signal distribution circuit formed therein, said optical signal distribution
9 circuit made up of interconnected semiconductor photonic elements and designed to provide
10 signals to the microelectronic circuit to be fabricated in the first region of the second
11 semiconductor layer; and
12 sending the optical-ready substrate to a purchaser that will subsequently fabricate
13 said microelectronic circuitry in the first region of the second semiconductor layer of the optical-
14 ready substrate by using a second set of semiconductor fabrication processes.

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